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(54) WINDSCREEN WIPER BLADE ASSEMBLIES

(71) We, TRICO-FOLBERTH LIMITED, a British Company, of Great West Road, Brentford, Middlesex, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to windscreen wiper blade assemblies which have the advantages of considerably less components than current assemblies used on curved windscreens, these components being simple to produce and to assemble under conditions of mass production.

A windscreen wiper blade assembly according to the present invention comprises at least one rigid body of channel section having its longitudinal free edges defining the open side of the channel and a web at a non-uniform distance from the open side and an integral flexible squeegee comprising a main part which lies within the channel, a wiping lip extending from the main part out of the open side of the channel and a resilient portion lying between the main part and the web of the channel, which resilient portion is adapted, when stressed, to apply a force to urge the main part of the squeegee away from the web, the force being applied either at several points or in a continuous distribution along the length of the main part of the squeegee, the channel being proportioned to limit rocking of the squeegee about axes parallel to the length of the channel while allowing flexing of the squeegee in the direction of the web of the channel while the lip is engaged in wiping the windscreen.

The invention, and further features which are not essential, but which may be advantageous, will be described in the course of the following description of several examples. Thes are shown in the accompanying drawings in which:—

Figure 1 is a side elevation, with part broken away, of an assembly, in a condition of maximum curvature;

Figure 2 is a side elevation, partly in section, of the same assembly in condition to engage a flat screen;

Figure 3 is a plan of the assembly of Figure 2;

Figures 4, 5 and 6 are cross sections on the lines IV—IV, V—V and VI—VI in Figure 2;

Figure 7 is a vertical section of another assembly, in a condition to engage a curved screen;

Figure 8 is a side elevation of the assembly of Figure 7, in condition to engage a flat screen;

Figure 9 is a plan of the assembly of Figure 8;

Figures 10, 11, 12 and 13 are sections on the lines X—X, XI—XI, XII—XII, and XIII—XIII in Figure 8.

Figure 14 corresponds to part of Figure 7, and shows a modification;

Figure 15 is a side elevation of another form of squeegee;

Figure 16 is a section on the line XVI—XVI in Figure 15;

Figure 17 is a side elevation of a further squeegee; and

Figure 18 is a section on the line XVIII—XVIII in Figure 17.

In the assembly shown in Figures 1 to 6, there is a rigid body 1 of inverted channel section, having the end portions of its free edges inclined to the centre portions thereof, and a web 25 which, as seen in side elevation, is a circular arc concave towards the free edges of the channel. There is an aperture 26 in the web 25 to receive the outer end of a wiper arm 8. This wiper arm, as shown in Figures 1 and 2, has an upwardly-facing hook extremity 27 which engages between a transverse pin 3 fixed across the body 1, and a metal spring strip 2 fixed at both ends to the web 25.

The squeegee is a unitary moulding of rubber or other resilient material, and comprises a wiping lip 6, a main part 9, a resilient part constituted by a series of C-shaped members 5, and a strap 4 which abuts the

web 25. This strap 4 is in two parts, between which is a central gap to accommodate the strip 2.

The channel has longitudinal flanges 7 extending towards each other (Figure 6) to retain the main part of of the squeegee.

The as-moulded i.e. unstressed condition of the squeegee is substantially as shown in Figure 2, i.e. with a straight wiping edge 28 to the lip 6. When the assembly is applied to a curved windscreen, the squeegee deforms in the manner shown in Figure 1, so that the wiping edge 28 becomes concave, and the C-shaped members 5 becomes flattened. These C-shaped members 5 thereupon apply forces to the main part, urging the main part away from the web 25. By this means a force towards the windscreen exerted by the wiper arm 8, transmitted through the strip 2 and the web 25, is distributed to the main part 9 by the C-shaped members 5, and by direct connections 24 between the main part 9 and the strap 4 at each end of the squeegee, and thereby the wiping lip 6 is applied to the windscreen throughout its length. This application occurs with a range of curvature of the windscreen, and is maintained if, during the course of wiping, the lip travels over parts not all flat or of the same curvature. That is to say, the structure permits flexure of the squeegee in the direction of the web 25. The shape and cross section of the C-shaped members 5 can be designed to produce a reaction load which is substantially constant throughout the range of deflection. Thus the force towards the windscreen transmitted by the wiper arm is substantially constant, and the pressure between the windscreen and each part of the lip is also substantially constant.

The extent to which the squeegee can rock relatively to the channel about axes parallel to the length of the body is limited in each direction by engagement of a respective side of the wiping lip 6 with the inner edge of the respective flange 7 of the channel. The rocking is enough to ensure trailing contact of the lip with a windscreen, but not so great as to risk the lip becoming flat on the windscreen.

To permit this rocking, there is a loose fit (too slight to be shown in the drawings) between the width of the squeegee part 9 and the internal width of the channel (after the sides of the channel have been pressed together and released, as described below).

As shown in Figures 4 to 6, the wiping lip 6 is of tapering cross section. It is found that this shape resists puckering of the lip when the squeegee is curved as shown in Figure 9, as compared with lips having a parallel-sided portion adjacent to the wiping edge.

It may be desirable to mould the squeegee in a condition in which the C-shaped members 5 produce, in the unstressed condition, a greater separation between the main part 9 and the strap 4 than is shown in Figure 2. This means that, when the squeegee is inserted into the channel, the C-shaped members 5 are in a state of pre-stress while the main part is in engagement with the flanges 7.

The body is initially made with its sides divergent, so that there is sufficient gap between the flanges 7 to admit the squeegee. After insertion of the squeegee, the sides of the channel are pressed together so as to be parallel when released. Then the pin 3 is added.

The construction shown in Figures 7 to 13 differs in that there are two rigid bodies of inverted channel section, 10 and 18, pivoted to one another on a transverse pin 14.

In addition, a central part of the squeegee adjacent to the pin 14 takes the form of portions 13 and 16 which are integral with each other at 33, and are integrally joined to the rest of the squeegee by a neck 34. The portions 13 and 16 together replace the leaf spring 2 of Figures 1 to 6, and act as a spring engaging the inner ends of the webs of the bodies 10 and 18, thus urging the bodies to rotate in opposite directions about the pivot 14, from the position shown in Figure 8 towards the position shown in Figure 7. The pressure towards the windscreen exerted by the wiper arm 17 is applied to the squeegee at 19, and transferred by the parts 13 and 16 to the webs of the bodies 10 and 18, and then back to the remainder of the squeegee through C-shaped members 12, and so through a main part to a wiping lip 21.

The dimensions of the parts 13 and 16 and their connection at 33 are such that the force they exert on the bodies 10 and 18 is sufficient to ensure that the wiping lip pressure is uniform throughout its length when presented to the maximum curvature windscreen for which it is designed, without the pressure between windscreen and lip becoming too small at the centre of the blade when presented to a flat screen.

There is a shroud 15 concealing the pin 14.

The assembly shown in Figures 7 to 13, is put together by sliding the bodies 10 and 18 onto the squeegee from opposite ends, after which the pin 14 is added.

In the modification shown in Figure 14, the function of the portions 13 and 16 is taken by a leaf spring 20.

Figures 15 and 16 show a squeegee adapted to replace that shown in Figures 1 to 6, in which the resilient means takes the form of a member 29, which is zig-zag in cross-section, cut away centrally at 30 to

accommodate a wiper arm connection as in Figures 1 and 2.

In the squeegee shown in Figures 17 and 18, intended for use with bodies similar to these shown in figs. 7 and 8, the resilient means is in the form of two extensions 35 of the main part of the squeegee of non-uniform depth. These extensions, in use, are engaged only at their ends by the end of the web of each respective body, as indicated by the arrows 36. This is achieved by forming the webs in such a way that the curvature of the webs is greater than the curvature of the rear faces of the extensions 35. The inner ends of the webs may be curved downwards, as shown in Figures 7 and 8, to engage the inner ends of the extensions 35. The bodies are biased by a leaf spring engaging the inner ends of the webs, the leaf spring also serving to secure the wiper arm to the pivot pin.

As an alternative to the provision of flanges on the body, the squeegee can be retained in the body by pierced apertures in the side walls of the channel which accept projections on the squeegee.

It is believed that wiper blade assemblies according to the present invention will have the following advantages:—

1. Surface areas which create lift from the windscreen when blades are subjected to high velocity air streams if the vehicle is travelling fast are considerably less than on orthodox blade assemblies.

2. With the resilient means contained in an enclosed envelope, snow cannot cause malfunction of the blade assembly as it does on open equalising lever constructions when snow lodges between the levers thus preventing free movement.

3. With only one mechanical moving joint, operating noise, a source of annoyance on multiple joint construction, will be avoided because the one joint is constantly loaded in one direction.

4. The distribution of wiper arm pressure along the wiping lip will be more uniform than is possible with the equalising lever and support strip systems, because of the closely spaced pressure points.

5. The squeegee can be designed to impart a constant reaction load regardless of the degree of deflection, thus permitting lighter arms loads and lighter gauge materials for the arm and blade assemblies.

6. By nesting the wiper arm deep in the or each channel section and avoiding an arm-to-blade attachment element mounted outside the channel section, the silhouette height of the assembly can be reduced to permit entry of the blades into a scuttle. This reduction in height of the arm-to-blade attachment also reduces the moment between the attachment point and the wiping lip, the drag load from which causes a torsional load on the wiper arm.

WHAT WE CLAIM IS:—

1. A windscreen wiper blade assembly comprising at least one rigid body of channel section having its longitudinal free edges defining the open side of the channel and a web at a non-uniform distance from the open side and an integral flexible squeegee comprising a main part which lies within the channel, a wiping lip extending from the main part out of the open side of the channel and a resilient portion lying between the main part and the web of the channel, which resilient portion is adapted, when stressed, to apply a force to urge the main part of the squeegee away from the web, the force being applied either at several points or in a continuous distribution along the length of the main part of the squeegee, the channel being proportioned to limit rocking of the squeegee about axes parallel to the length of the channel while allowing flexing of the squeegee in the direction of the web of the channel while the lip is engaged in wiping the windscreen.

2. An assembly according to claim 1, in which the web of the channel, as seen in side elevation, is a circular arc concave towards the free edges of the channel.

3. An assembly according to claim 1 or claim 2, in which the channel has longitudinal flanges extending towards each other to retain the main part of the squeegee within the channel.

4. An assembly according to claim 3, in which the resilient portion is proportioned so as to be in a state of pre-stress when the main part is in engagement with the flanges.

5. An assembly according to any of claims 1 to 4, in which the resilient portion is constituted by a series of C-shaped members.

6. An assembly according to any of claims 1 to 5, in which the squeegee is a unitary moulding of rubber or other resilient material, and comprises a wiping lip, a main part, a resilient part constituted by a series of C-shaped members, and a strap which abuts the web.

7. An assembly according to claim 6, in which the squeegee has, in its unstressed condition, a substantially straight wiping edge to the lip.

8. An assembly according to claim 6 or claim 7, in which there are direct connections between the main part and the strap at each end of the squeegee.

9. An assembly according to any of claims 1 to 8, in which the wiping lip is of tapering cross section.

10. An assembly according to claim 1, wherein there are two rigid bodies of channel section, pivoted to one another on a

transverse pin, and a central part of the squeegee adjacent the pin takes the form of integral portions which are integrally joined to the rest of the squeegee by a neck, these portions acting as a spring engaging the inner ends of the webs of the bodies, thus urging the bodies to rotate in opposite directions about the pivot.

11. An assembly according to claim 10, including a shroud concealing the pin.

12. A windscreen wiper blade assembly according to claim 1, substantially as described with reference to Figures 1 to 6, Figures 7 to 13, Figure 14, Figures 15 and 16, or Figures 17 and 18 of the accompanying drawings.

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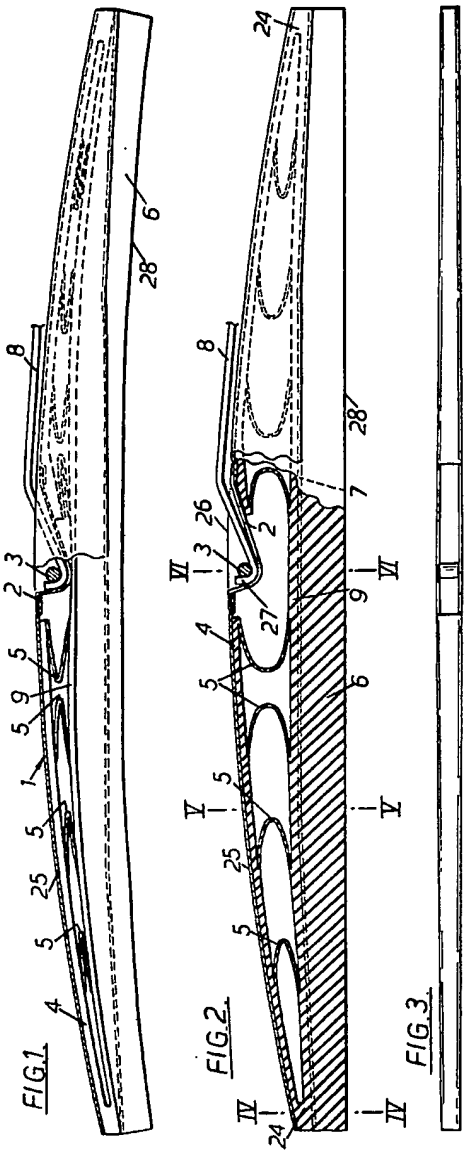
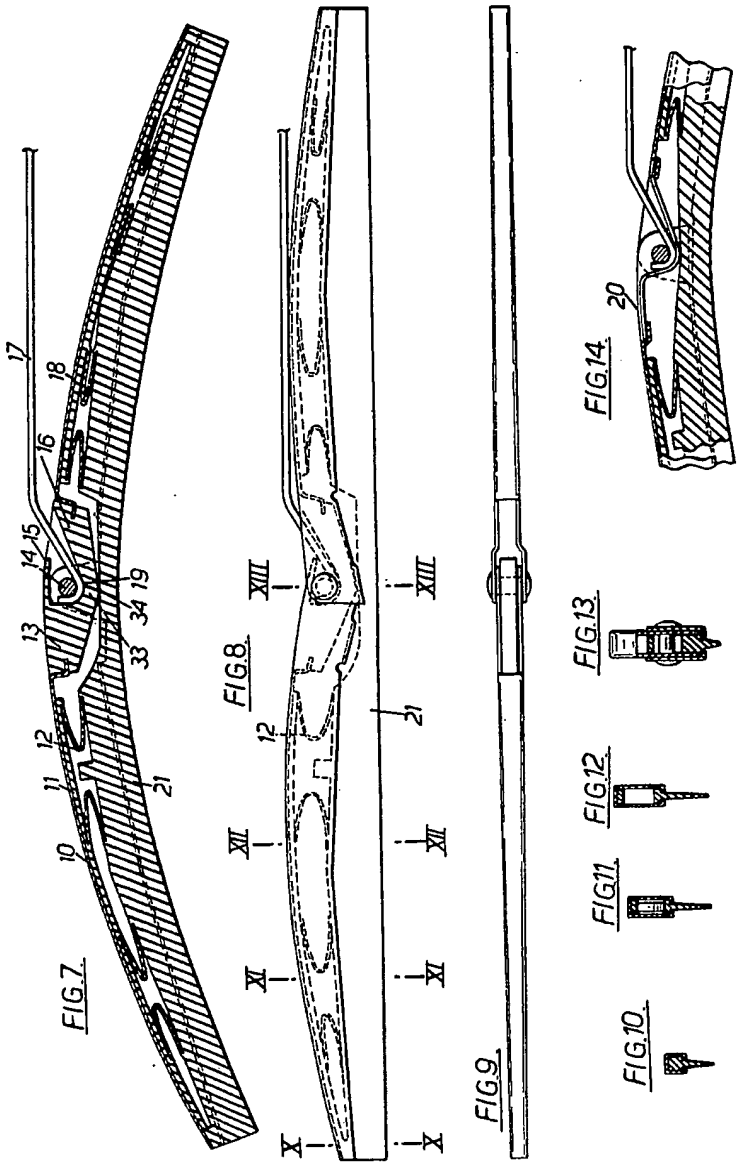
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1




17
18
16
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13
19
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12
11
10
21
FIG.7
XIII
XII
X
FIG.8
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21
FIG.9
20
FIG.14
FIG.13
FIG.12
FIG11
FIG.10

FIG.16.

FIG.18.

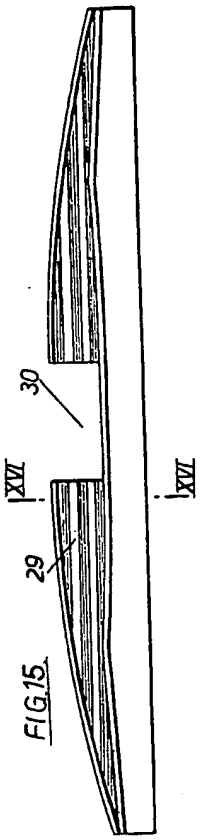

FIG.15.

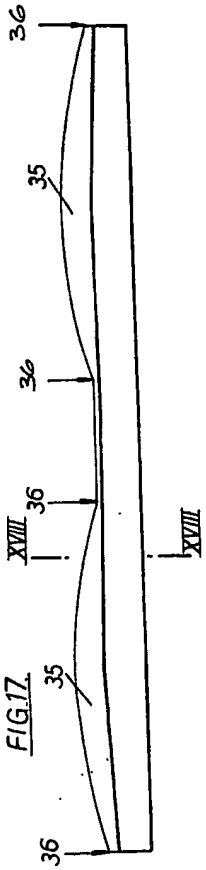

FIG.17.